

# Webinar:

Inspiring Students Through Hands-On STEM: Practical Tools for Real-World Learning

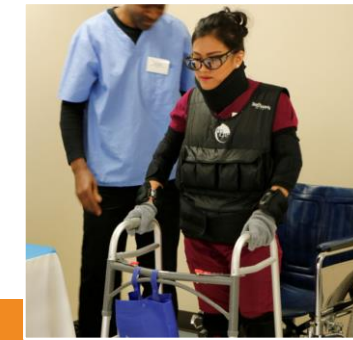
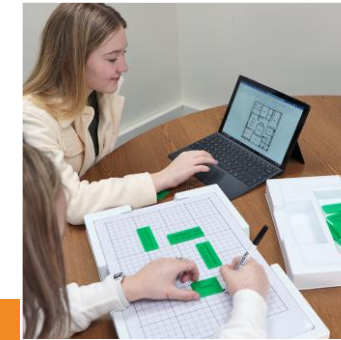
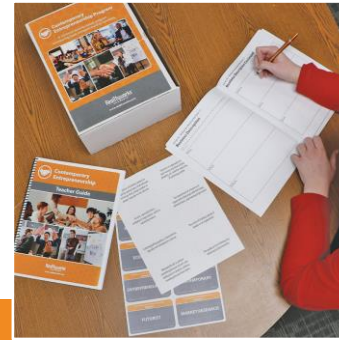
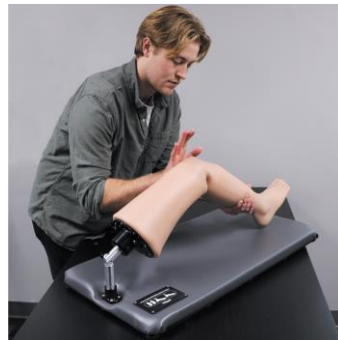
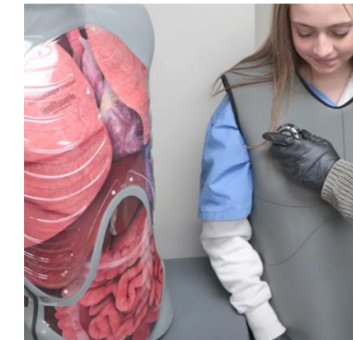


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*Live it. Learn it.™*

100% EMPLOYEE-OWNED



# Who is Realityworks?



We partner with educators, administrators and industry leaders to ensure our offerings meet their needs and make lessons truly meaningful.

**Realityworks®**  
Live it. Learn it.™  
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Presented by

# Todd Hunter

STEM & Career Exploration Product Manager

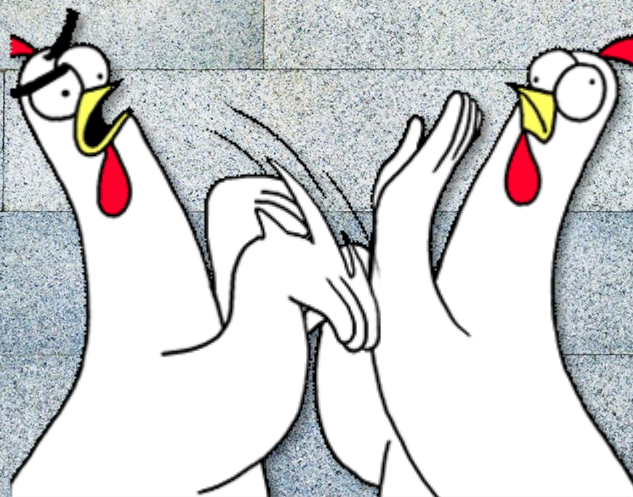
[Todd.hunter@realityworks.com](mailto:Todd.hunter@realityworks.com)

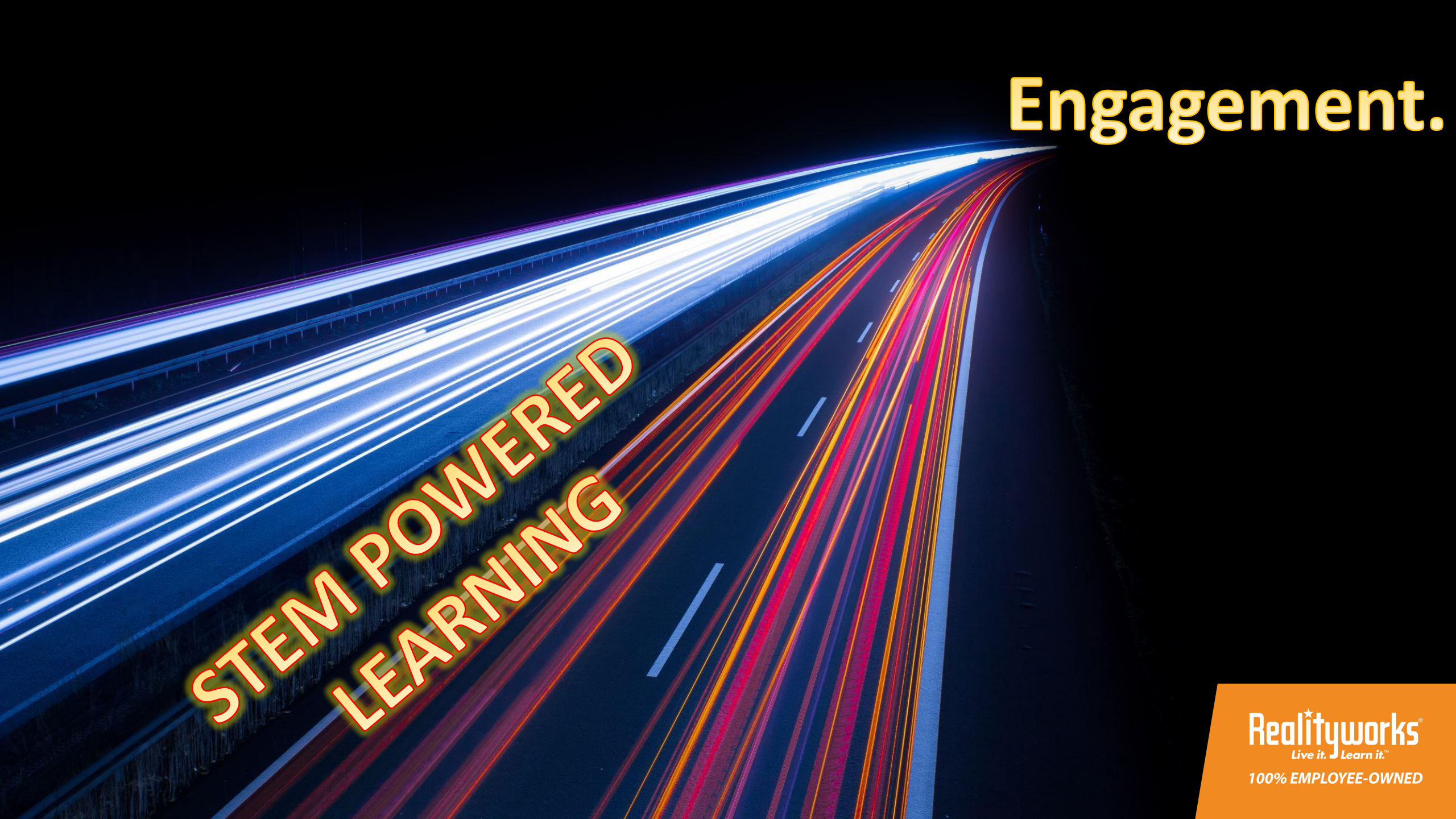
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**Engagement.**



A long-exposure photograph of a multi-lane highway at night. The image shows vibrant, colorful light trails from vehicles, primarily in shades of blue, white, red, and orange, curving into the distance under a dark sky. The perspective is from an elevated position looking down the road.

# Engagement.

STEM POWERED  
LEARNING

**Realityworks**  
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# Realityworks creates STEM Powered Learning Experiences.



Electrical Wiring Kit



Measurement Math  
Training Kit



RC Tractor Pull Challenge

# The STEM 7

## What does **STEM Powered** mean?

- ☐ Focused on real-world problems
- ☐ Engagement in engineering design
- ☐ Context integration
- ☐ Content Integration
- ☐ Engagement in authentic STEM practices
- ☐ 21<sup>st</sup> century skills
- ☐ Promote STEM careers

*"Beyond The Basics: a detailed conceptual framework of integrated STEM."*  
By Gillian Roehrig @UM-Twin Cities

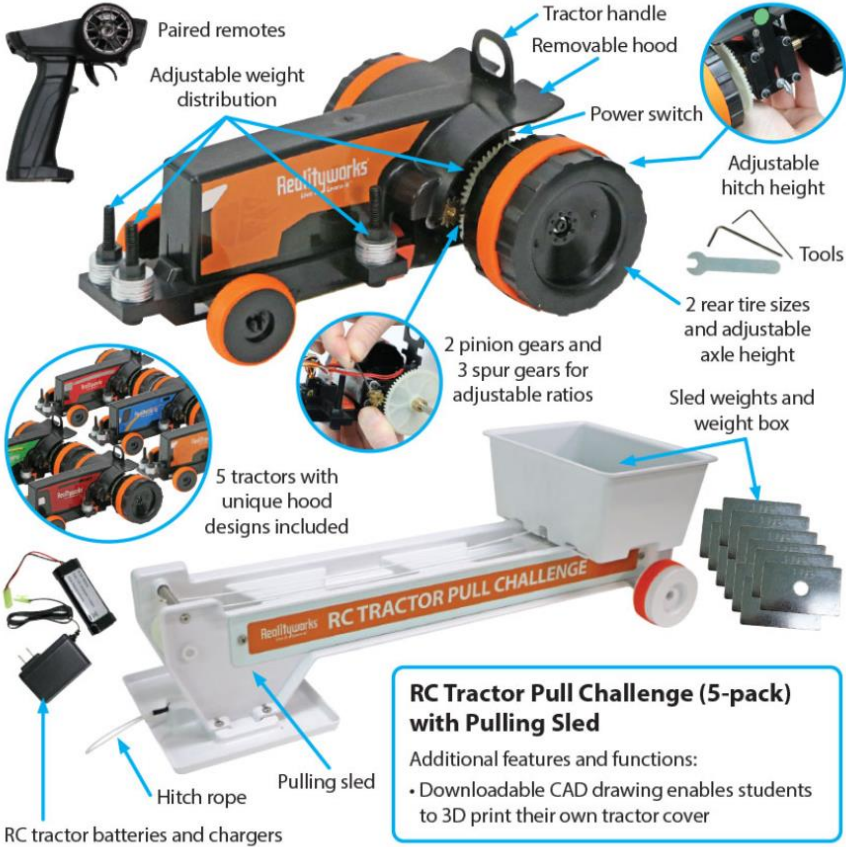
# RC Tractor Pull Challenge



## STEM 7:

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# RC Tractor Pull Challenge



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# RC Tractor Pull Challenge



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## Synopsis:

These tractor kits and accompanying curriculum provide information about the science and mechanics of a tractor pull. It includes lessons on tractor parts, science concepts, as well as collecting and analyzing data. The lessons and activities include objectives, materials required, and approximate class time.

## Curriculum Components:

- Curriculum
- Student materials
- Slide presentations

## Learning Objectives:

### Lesson 1 – About the Tractor

- Describe the parts of the tractor and know how to modify them
- Describe what makes a scientific test “fair”

### Lesson 2 – Divide and Conquer!

- Design and conduct a fair test to measure the effect of one variable on another
- Determine appropriate sampling for continuous independent variables
- Keep control variable constant
- Accurately measure distance

### Lesson 3 – Gears and Tires

- Calculate the mechanical advantage for a set of gears
- Choose the appropriate gearing for speed or power
- Calculate mechanical advantage for a tire and axle system
- Choose the appropriate tire and axle configuration for speed or power
- Calculate mechanical advantage for a compound (machine) system

### Lesson 4 – Weight and Friction

- State and apply Newton’s 3rd Law
- Define normal force

### Lesson 5 – Tractor Pull!

- Reason semi-quantitatively about the amount of frictional force
- Reason semi-quantitatively about force at an angle

# RC Tractor Pull Challenge

## Features

- Remotes come paired to the tractors
- Adjustable components to teach about gears, tires, weight, and friction
- CAD drawings for custom 3D-printed tractor covers
- Helps teach a variety of STEM concepts, such as force and motion
- Comes with CASE-aligned curriculum
- Encourages teamwork, problem solving, and STEM education

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### RC Tractor Pull Challenge (5-pack) with Pulling Sled

\$3,099 – 40610105

Create interactive STEM challenges focused on variables like force and motion while developing teamwork and problem-solving skills.

RC Tractor Pulling Sled add-on \$699 – 40610100



#### Specifications:

- Tractor dimensions: 9.5" (24.13 cm) x 6.5" (16.51 cm) x 4.5" (11.43 cm)
- Tractor weight: 1.5 lbs (0.68 kg)
- Sled dimensions: 20" (50.8 cm) x 6.5" (16.51 cm) x 6.5" (16.51 cm)
- Sled weight: 1 lb (0.45 kg)

**Students can assemble each of the five tractors and experiment with variables for different pulling outcomes.**

# RC Tractor Pull Challenge



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## What classes would benefit from this RC Tractor Pull Challenge?

### Agriculture:

- Exploratory and introductory agriculture classes
- Agriculture mechanics
- Agricultural and field management
- Agriculture structures and electronics

### STEM:

- General and introductory STEM
- Engineering prep classes
- Design and engineering principles

### Trades:

- General and introductory trade skills course
- Simple machines and basic mechanics
- FabLab experience

### Science:

- General science
- Physical science
- Physics
- Applied science

# RC Tractor Pull Challenge



## STEM 7:

- ✓ Focused on real-world problems
- ✓ Engagement in engineering design
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- ✓ Promote STEM careers

*Questions?*

# Electrical Wiring Kit

- *How do I teach this in a classroom setting?*
- *I don't have space for this!*
- *How do students know they did it correct?*
- *I can't be everywhere at once?*
- *Students are too scared to do this!*
- *I don't have time to build this or get it all ready to teach with.*



# Electrical Wiring Kit

## Features

### Use the Electrical Wiring Kit to:

- Teach electrical wiring basics
- Demonstrate correct wiring techniques
- Conduct student-led electrical wiring exercises
- Safely identify and correct issues at a glance
- Improve classroom management and safety

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**Wall Panel Demonstrator**

**Electrical Wiring Assessment Kit:**

- 2 Breakout Boxes
- 2 Light Socket Testers
- 3 cables: Breakout Box Cable, Outlet Cable and Socket Tester Cable
- 4 AA batteries

**Electrical wiring components:**

- 2 single Pole Switches
- (2) 3-way switches
- (3) 15A duplex receptacles
- 2 ceramic lamp holders
- 1 ceramic lamp holder, with pull chain
- 20 feet of 14-2 NM-B with ground wire
- 13 feet of 14-3 NM-B with ground wire
- 25 standard wire connectors
- 1 roll of black electrical tape

**RealCareer™ Electrical Wiring Kit**

**Student Exercise Workbook**  
(16 student-led exercises)

**Additional features and functions:**

- Portable, battery-operated kit
- Uses low-voltage DC power to assess AC wiring
- Instant assessment and corrective feedback

**Student Exercises**

# Electrical Wiring Kit



- Safe Testing
- Provides immediate assessment
- Battery powered:
  - *No wall connection needed.*

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# Electrical Wiring Kit



*Experiential Learning Technology*

## RealCareer™ Electrical Wiring Kit

### Curriculum Overview

#### Designed for:

- High school students
- Post-secondary students
- Workforce development programs

#### Length:

This 13-hour curriculum is comprised of 3 lessons, 12 exercises and 4 enhancement exercises

#### Goal:

To give students general electrical wiring training and assessment on how to do proper household and commercial wiring.

#### Synopsis:

This kit and accompanying curriculum provide general electrical wiring training for common household and building wiring. This program will safely train students on electrical wiring, provide repetitive practice and assessment to increase wiring skills, introduce standard electrical symbols and electrical theory.

#### Curriculum Components:

- Teacher guide with 3 lessons
- Presentation slides
- Student exercises - set of 12 with 4 enhancement exercises

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### Learning Objectives:

| Lesson | Title                                                                                                | Approximate Time |
|--------|------------------------------------------------------------------------------------------------------|------------------|
| 1      | Electrical Safety – Personal safety, personal protective equipment, circuit safety, end user safety  | 60-70 minutes    |
| 2      | Electrical Principles – Current, Voltage, Series and Parallel Circuits and Power                     | 60-70 minutes    |
| 3      | Basic Wiring Skills – The home electrical system, fixtures, wire, reading prints and troubleshooting | 60-70 minutes    |

| Exercises<br>(with Electrical Wiring<br>Kit accessories) | Title                                                                                            | Approximate Time |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------|
| 1                                                        | Wire a single outlet                                                                             | 10 minutes       |
| 2                                                        | Wire two outlets in different boxes                                                              | 25 minutes       |
| 3                                                        | Wire a single-pole switch controlling a single light                                             | 20-25 minutes    |
| 4                                                        | Wire a single-pole switch controlling two lights                                                 | 40-45 minutes    |
| 5                                                        | Wire two single-pole switches controlling two lights                                             | 45 minutes       |
| 6                                                        | Wire an outlet, light with pull chain – power through outlet                                     | 25-30 minutes    |
| 7                                                        | Wire a single-pole switch, light and outlet using 14-3                                           | 30-35 minutes    |
| 8                                                        | Wire an outlet and switch in double gang box with a light in another box, power from light       | 30-35 minutes    |
| 9                                                        | Wire 3-way switches with one light                                                               | 30 minutes       |
| 10                                                       | Wire 3-way switches with one light, with power through light                                     | 30-35 minutes    |
| 11                                                       | Wire 3-way switches with one light, with power entry through both switches first                 | 30-35 minutes    |
| 12                                                       | Wire 3-way switches with one light, with power entry through light first then switches in series | 35 minutes       |

| Enhancement<br>Exercises<br>(extra wiring<br>accessories<br>needed) | Title                                                                           | Approximate Time |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------|
| 1                                                                   | Wire two single-pole switches with two lights, with power entry through a light | 60-65 minutes    |
| 2                                                                   | Wire 3-way switches with two lights, with power entry through both switches     | 60-65 minutes    |
| 3                                                                   | Wire single-pole switch with two lights and two outlets, power through switch   | 60-65 minutes    |
| 4                                                                   | Wire a split-circuit outlet                                                     | 60-65 minutes    |

# Electrical Wiring Kit

RealCareer™ Electrical Wiring Kit Curriculum

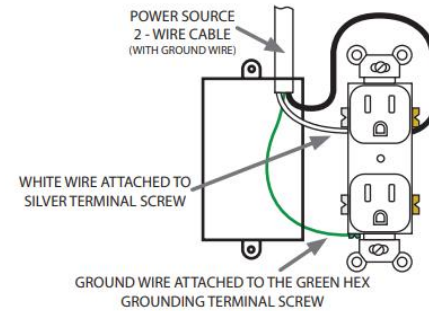
Name: \_\_\_\_\_ Class: \_\_\_\_\_

## Lesson 2: Worksheet 1

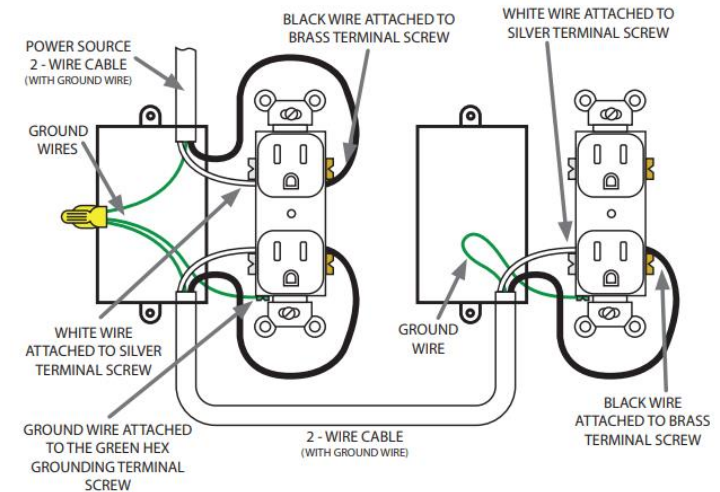
Answer the following questions as you view the accompanying slide presentation.

1. If a load has a resistance of 5 ohms, how much current will it draw from a 120-volt power supply?
2. If a load is drawing 1.5 amps from a 120-volt supply, what is the load's resistance?
3. A 23-ohm load is drawing 5.0 amps. What is the supply voltage?
4. If an appliance has a cord that can only handle 10 amps, how much voltage needs to be applied to it to deliver 2400 watts?
5. A 120-volt toaster draws 1200 watts. How many amps is this?
6. How many watts can a 15-amp circuit deliver before tripping the 120V circuit breaker?
7. How many amps does a 60-watt light bulb draw from a 120-volt supply?
8. If a load draws 42 amps from a 120-volt supply, how many amps will it draw from a 240-volt supply to receive the same power?
9. A cell phone charger claims to draw 0.35 amps from a 120-volt outlet. How many watts is this?
10. A 50-foot length of wire has a resistance of 0.08 ohms. If 10 amps are flowing through the wire, what is the voltage loss across this length of wire?

### Exercise 1: Single Outlet



### Exercise 2: 2 Outlets in Different Boxes

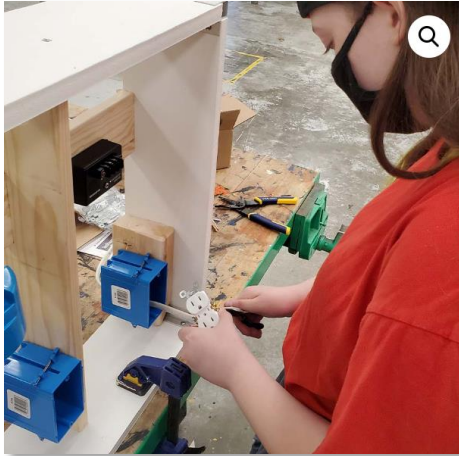


| WIRE AND SCREW COLOR DIAGRAM KEY |                      |   |                       |
|----------------------------------|----------------------|---|-----------------------|
| —                                | BLACK WIRE (HOT)     | ■ | BLACK TERMINAL SCREW  |
| —                                | WHITE WIRE (NEUTRAL) | ■ | SILVER TERMINAL SCREW |
| ---                              | RED WIRE (HOT)       | ■ | COPPER TERMINAL SCREW |
| —                                | GREEN WIRE (GROUND)  | ■ | GREEN GROUNDING SCREW |

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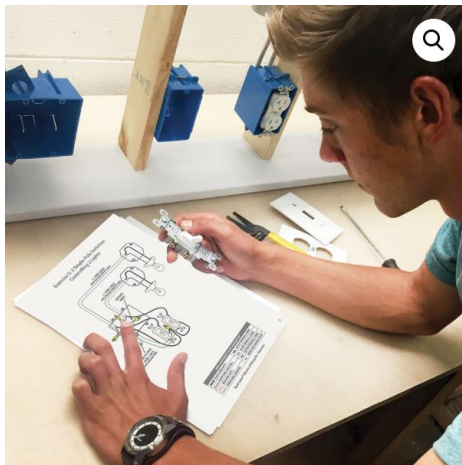
# Electrical Wiring Kit



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*Questions?*



# Measurement Math Training Kit



## STEM 7:

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Includes 5 sets!

Includes online lessons and activities  
(tablet not included)

Free online trials available at  
[www.realityworks.com/product/measurement-math](http://www.realityworks.com/product/measurement-math)

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# Measurement Math Training Kit

- 5 precision cut manipulatives to put measurement into context.
- Use your classroom's measuring tools to reinforce learning and guarantee transfer.
- 7 Lessons to guide students in different skills.

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# Measurement Math Training Kit



# Measurement Math Training Kit

## Lesson Six – Measurements Using a Tape Rule and Tape Measure

### Taking Measurements with a Ruler (Standard)

#### Use Object 3

Find the length of the following in inches:

1. Side A
2. Side L
3. Side B
4. Side N
5. Side H
6. Side D
7. Side M
8. Side I



Find the following combined measurements:

9. Side K + Side F
10. Side E + Side G
11. Side I + Side L – Side C

12. Which of the following sides is  $1 \frac{1}{2}$  inches?

- A. Side H
- B. Side F
- C. Side J
- D. Side N

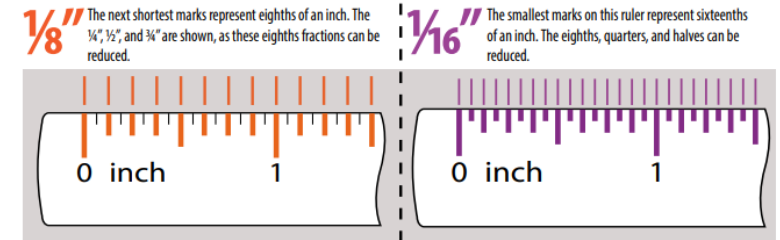
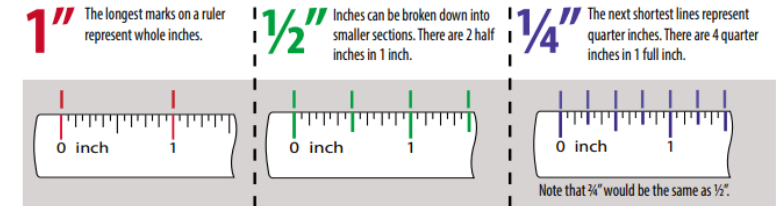
Measurement Math Student Workbook | Realityworks, Inc.

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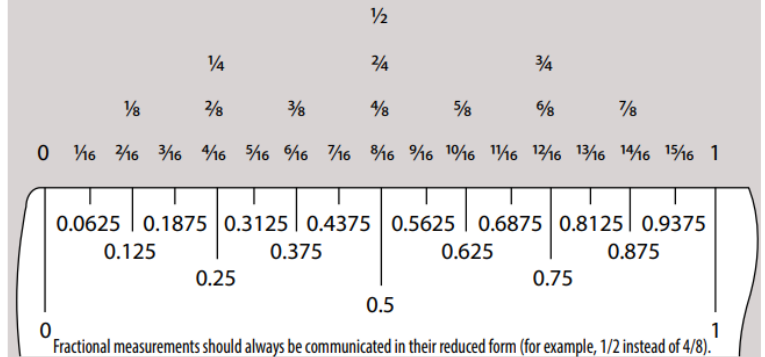
## Using a Ruler for Standard Unit Measurements

### Measurement Units on a Ruler (Standard)

Standard rulers typically measure distances down  $\frac{1}{16}$  of an inch, although some versions have marks down to  $\frac{1}{32}$  or  $\frac{1}{64}$  of an inch. Many rulers have inches on one side and centimeters on the other. Rulers are generally 6, 12, or 36 inches long.



The image below shows the relationship between the fractional and decimal values of each mark between 0 and 1 inch.



Measurement Math Student Workbook | Realityworks, Inc.

5

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# Measurement Math Training Kit

## Career Exploration Stations

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### How to Read a Ruler and Tape Measure Exit Ticket

1. What is 32 centimeters in inches?

- A. 10.2394 inches
- B. 12.5984 inches
- C. 14.5692 inches
- D. 12.2390 inches

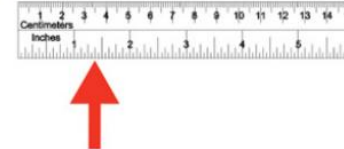
2. What is the measurement shown on the tape measure below in inches?

- A.  $102\frac{3}{16}$  inches
- B.  $101\frac{7}{8}$  inches
- C.  $102\frac{1}{8}$  inches
- D.  $102\frac{7}{8}$  inches



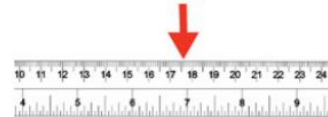
3. What is the measurement shown on the ruler below?

- A.  $1\frac{1}{16}$  inches
- B.  $1\frac{1}{4}$  inches
- C.  $1\frac{1}{2}$  inches
- D.  $1\frac{3}{8}$  inches



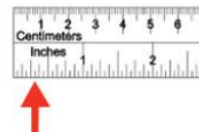
4. What is the measurement shown on the ruler below in centimeters?

- A. 17.4 cm
- B. 17 cm
- C. 17.6 cm
- D. 17.8 cm



5. What is the measurement shown on the ruler below?

- A.  $\frac{3}{16}$
- B.  $\frac{5}{16}$
- C.  $\frac{1}{4}$
- D.  $\frac{3}{8}$



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# Questions?

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### Measurement Math Training Kit

\$899 – 58010100

Train and test students on more than 250 measurements through hands-on manipulatives and interactive lessons.

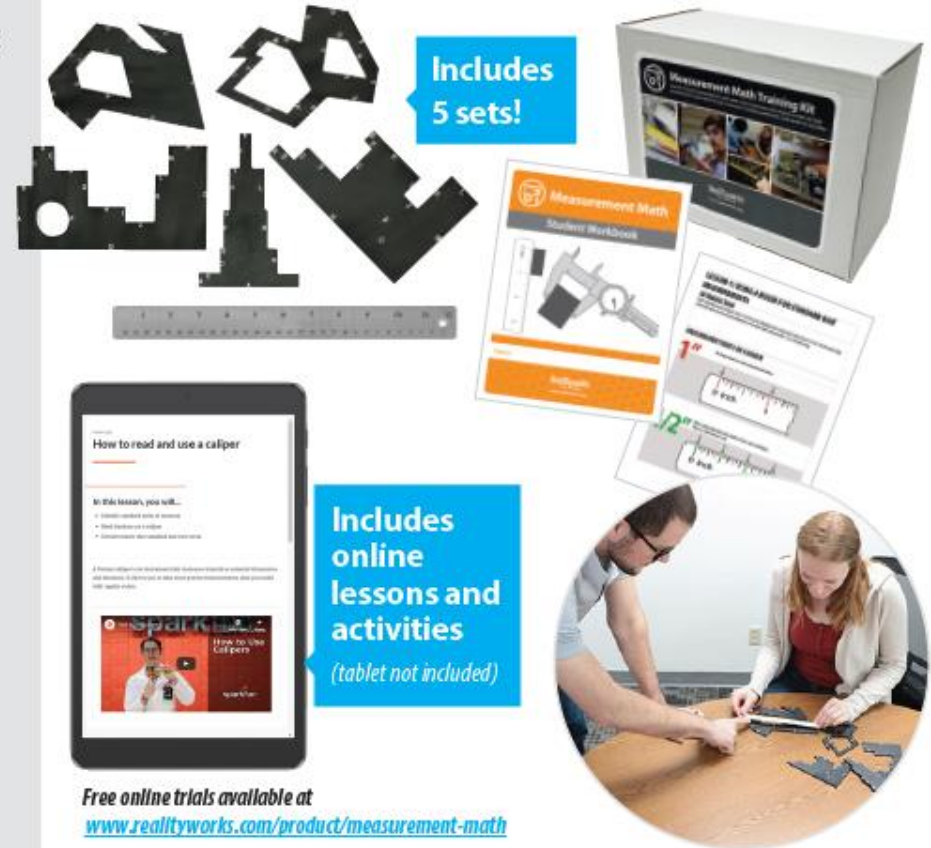
#### Includes:

- 5 sets of measurement manipulatives, rulers, and storage boxes
- 20 student workbooks
- Standards-based, downloadable curriculum
- Student access to online lessons and activities
- 1-year limited warranty

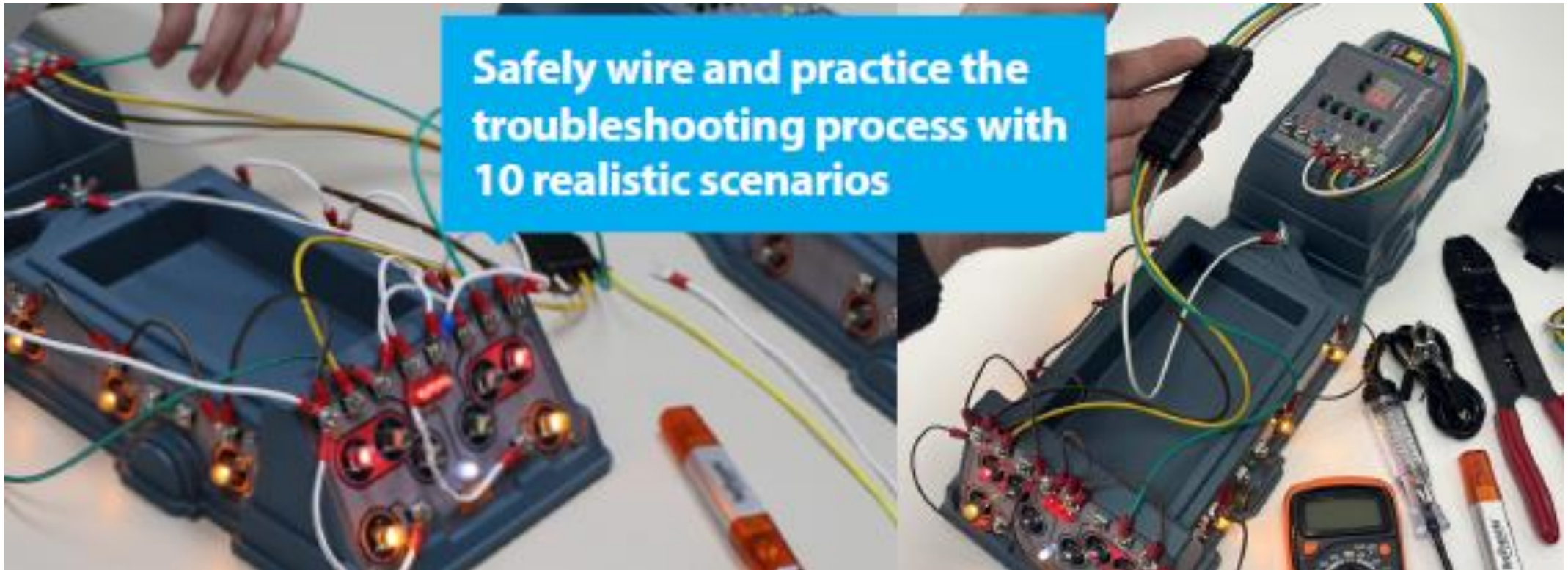
### Measurement Math Student Workbooks (Set of 20) \$369 – 58010120

#### Measurement Math

- Curriculum lesson topics:
  1. Metric and Standard Readings
  2. How to Read a Ruler/Tape Measure
  3. How to Read and Use a Caliper
  4. Decimals
  5. Conversions
  6. Measurements Using a Tape Measure
  7. Measurements Using a Caliper
- Teaching hours: 5-10



# NEW: Trailer Circuits STEM Kit



## STEM 7:

- ☒ Focused on real-world problems
- ☐ Engagement in engineering design
- ☐ Context integration
- ☐ Content Integration
- ☐ Engagement in authentic STEM practices
- ☐ 21<sup>st</sup> century skills
- ☐ Promote STEM careers

# Trailer Circuits STEM Kit

**NEW** Trailer Circuits STEM Kit  
\$1,999 – 47010100

3 trailer wiring trucks

Safely teach learners the basics of electricity, skills to build circuits, and how to apply their understanding to properly wire and trouble-shoot trailer circuits.



**Features:**

- Working brake, turn, running, marker, and reverse lights
- Built-in assessment mode

*Specifications:*



## STEM 7:

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- ☒ 21<sup>st</sup> century skills
- ☒ Promote STEM careers

# Trailer Circuits STEM Kit



# Trailer Circuits STEM Kit

| Lesson     | Title                                           | Approx. Time    |
|------------|-------------------------------------------------|-----------------|
| 1          | DC Electricity Basics                           | 50 minutes      |
| 2          | Circuit Types and Wiring Skills                 | 50 minutes      |
| 3          | Wiring the 4-Way Flat Harness                   | 50 minutes      |
| 4          | Testing with a Multimeter and Auto Light Tester | 50 minutes      |
| 5          | Wiring the 7-way Round Harness                  | 50 minutes      |
| 6          | Connecting the 7-Way Round Harness              | 50 minutes      |
| 7          | How To Troubleshoot Electrical Circuits         | 50 minutes      |
| 8          | Practice Troubleshooting with Scenarios 2-11    | 50 minutes      |
| Assessment | Teacher Assessment Mode                         | 20 – 50 minutes |

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# Trailer Circuits STEM Kit

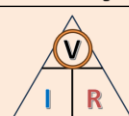
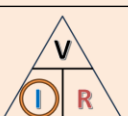
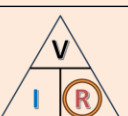
|   |                                                 |
|---|-------------------------------------------------|
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| A | Teacher Assessment Mode                         |

**We communicate and measure electricity with these concepts:**

- Current
- Voltage
- Resistance
- Power

Trailer Circuits STEM Kit 11

**Math Tool:**  
Use the Ohm's Law Pyramid to find the right equation.

| To Find Voltage                                                                                         | To Find Current                                                                                          | To Find Resistance                                                                                       |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <br>$V = I \times R$ | <br>$I = \frac{V}{R}$ | <br>$R = \frac{V}{I}$ |

Trailer Circuits STEM Kit 14

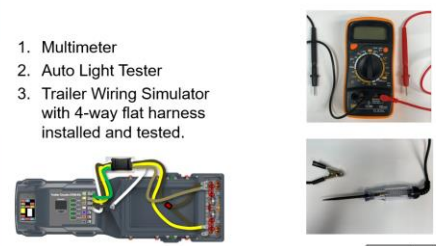
**Done with the Student Workbook for Lesson 1?**

See your teacher to check the key and/or turn in.

Trailer Circuits STEM Kit 15

**You will need these items:**

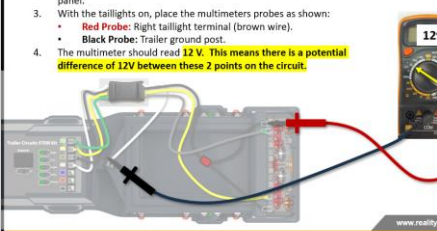
- Multimeter
- Auto Light Tester
- Trailer Wiring Simulator with 4-way flat harness installed and tested.



Trailer Circuits STEM Kit 16

**Using the Multimeter:**  
**Measuring Voltage: Try it!**

- Turn on the Simulator with the 4-way flat harness installed.
- Turn on the taillights by gently clicking the Lights button on the control panel.
- With the taillights on, place the multimeter's probes as shown:
  - Red Probe: Right taillight terminal (brown wire).
  - Black Probe: Trailer ground post.
- The multimeter should read **12 V**. This means there is a potential difference of 12V between these 2 points on the circuit.



Trailer Circuits STEM Kit 18

**Congratulations!**

You can now test circuits with:

- Auto Light Tester
- Multimeter

You know how to:

- Check for continuity.
- Measure Voltage and Current.

Trailer Circuits STEM Kit 17

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## Student Slides

# Trailer Circuits STEM Kit

|   |                                                 |
|---|-------------------------------------------------|
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| A | Teacher Assessment Mode                         |

Trailer Circuits STEM Kit Curriculum

Name: \_\_\_\_\_ Class: \_\_\_\_\_

## Lesson 1: DC Electricity Basics

Directions: As follow the Lesson 1: DC Electricity Basics slideshow complete the following questions.

- How many mA of current will result in the "Can't Let Go" phenomena?
- Fill in the blank: Electromagnetism is one of the \_\_\_\_ fundamental forces of the Universe.
- What is the difference between AC and DC, and which would you find in the circuits powering a vehicle's trailer?
- Electricity can be thought of as the movement of what through a material?
- How are the electrons around conductors different from the electrons around insulators?
- Complete the missing fields in the table below:

| Electrical Property | Equation Variable | Unit | Definition |
|---------------------|-------------------|------|------------|
| Voltage             |                   |      |            |
| Current             |                   |      |            |
| Resistance          |                   |      |            |
| Power               |                   |      |            |

- Load:** In your kitchen... what are 4 appliances might make up the load of a kitchen circuit?
- What is the difference between AC and DC currents?

Trailer Circuits STEM Kit Curriculum

## Lesson 6: Connecting the 7-Way Round Harness.

Directions: As follow the Lesson 6 slideshow complete the following questions.

- Why should the simulator be turned off before you start making connections with the harness?
- Review:** Brown & White: Try This Question: (see Slide 14 in Lesson 6 PPT)
  - When you pulled the bulb out of the socket, did any of the other brown-connected lights change?
  - What does this tell you about the circuit you have used to wire all the brown-connected lights? Is it a series or parallel circuit, and how do you know?
- As you work through this lesson, create a 7-Way Wiring Color Key by filling in this table.

| Wire Color | What does it connect to? |
|------------|--------------------------|
| Green      |                          |
| Yellow     |                          |
| Brown      |                          |
| White      |                          |
| Blue       |                          |
| Red        |                          |
| Black      |                          |

- Continuity Check:** For each wire record your testing results in the table; Check the box in the Continuity Test if the meter confirms Continuity with a beep/flash.

| Wire Color | Continuity Test          |
|------------|--------------------------|
| Green      | <input type="checkbox"/> |
| Yellow     | <input type="checkbox"/> |
| Brown      | <input type="checkbox"/> |
| White      | <input type="checkbox"/> |
| Blue       | <input type="checkbox"/> |

Trailer Circuits STEM Kit Curriculum

## Lesson 7: How To Troubleshoot Electrical Circuits

Directions: As follow the Lesson 6 slideshow complete the following questions.

- Why is it important to follow a process when troubleshooting?
- Fill in the circles with the steps of our Troubleshooting Process:



- Why do the arrows connect the last and first step of the Troubleshooting Process?
- Troubleshooting Tools Table:** Complete the missing fields:

| Tool            | What does it measure? | What can it tell you? |
|-----------------|-----------------------|-----------------------|
| Auto Test Light |                       |                       |
| Multimeter:     |                       |                       |

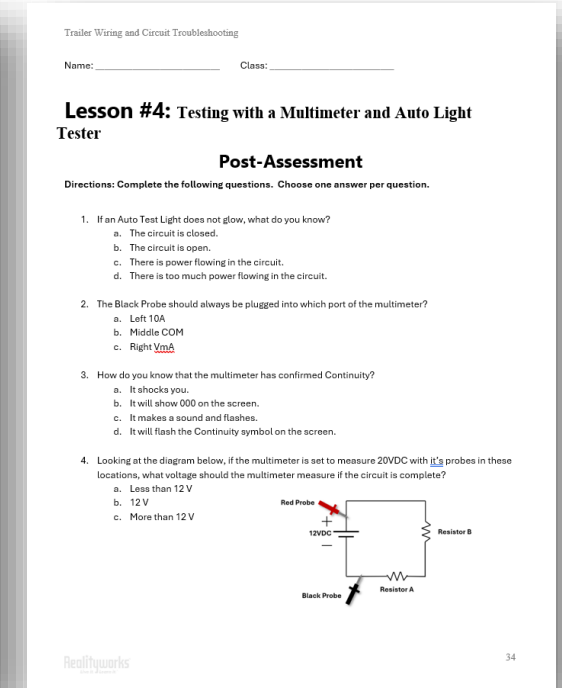
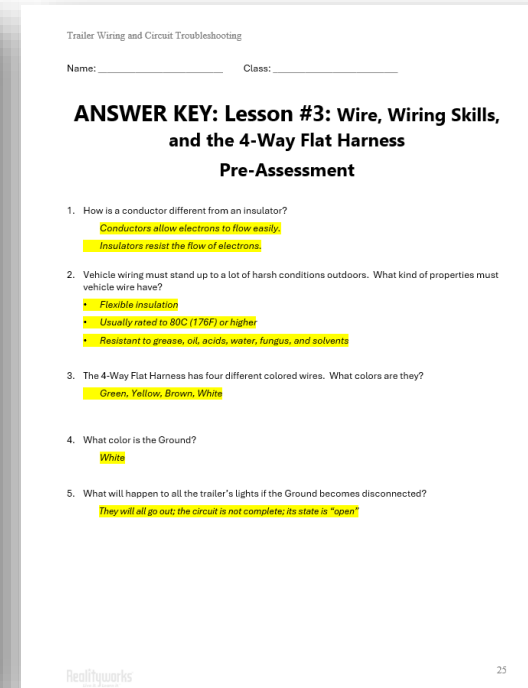
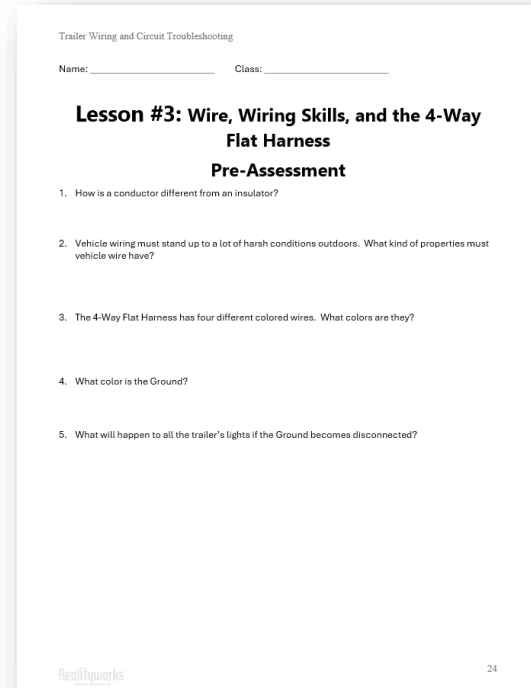
## Student Workbook

### STEM 7:

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# Trailer Circuits STEM Kit

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- Pre & Post Assessments w/Keys
- Student Workbook Keys

# Trailer Circuits STEM Kit

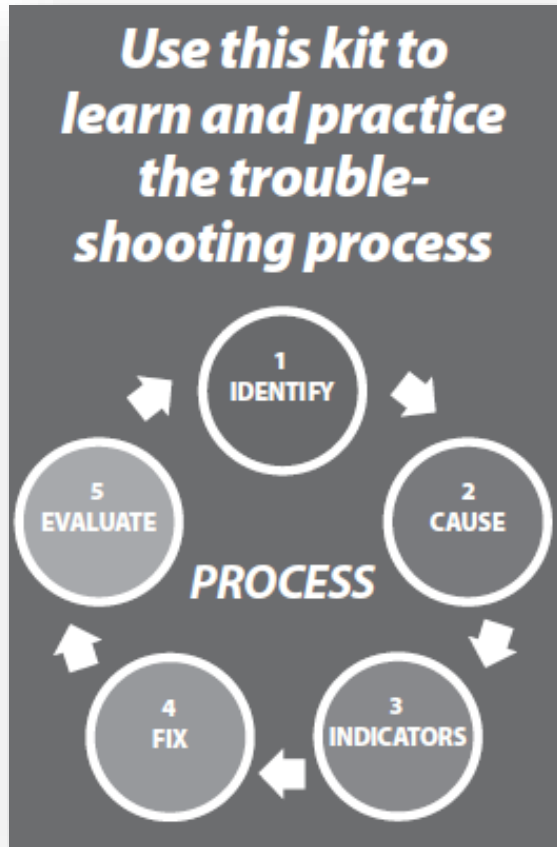


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# Trailer Circuits STEM Kit



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# Trailer Circuits STEM Kit



What about safety?

*Multimeter shows 12V!  
Won't it shock students!?*

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**NEW**

## Trailer Circuits STEM Kit

\$1,999 – 47010100

Safely teach learners the basics of electricity, skills to build circuits, and how to apply their understanding to properly wire and trouble-shoot trailer circuits.

3 trailer wiring trucks



### Features:

- Working brake, turn, running, marker, and reverse lights
- Built-in assessment mode

### Includes:

- 3 trailer wiring trucks each with:
  - 4-way connection harness
  - 7-way connection harness
  - Replaceable LED bulbs
  - Wire stripper and crimping tool
  - Auto test light and multimeter
  - Screwdriver
  - U-shaped crimp terminals
  - Splice and butt connectors
  - Batteries
  - Storage Box
- Teacher's kit:
  - Spare components kit
  - 7 spools of bulk wire
  - Standards-based, downloadable curriculum
  - Downloadable student workbook
  - 1-year limited warranty

### Specifications:

- Dimensions: 20" x 7" x 4"
- Weight: 2 lbs

### Trailer Circuits

- Curriculum lesson topics:
  1. DC Electricity Basics
  2. Circuit Types and Wiring Skills
  3. Wiring the 4-Way Flat Harness
  4. Testing with a Multimeter and Auto Test Light
  5. Wiring the 7-Way Round Harness
  6. Connecting the 7-Way
  7. How To Troubleshoot Electrical Circuits
  8. Practice Troubleshooting Scenarios
  9. Teacher Assessment Mode
- Teaching hours: 8



# Trailer Circuit STEM Kit

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# Questions?

# Realityworks creates STEM Powered Learning Experiences.



Electrical  
Wiring Kit



RC Tractor  
Pull  
Challenge



Measurement  
Math  
Training Kit



**NEW** Trailer  
Circuits  
STEM Kit



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- Ask questions and more

Scan me

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